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Surface Pressure Distributions of Downburst captured by High Dense Ground Observation Network ”POTEKA” on 22 August 2014

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Meisei developed low-cost compact weather sensor (POTEKA Sta., hereinafter referred to as the POTEKA), which can measure temperature, relative humidity, pressure, sunlight, and rain detection per one minute and we installed high ground observation network (total 55 stations, 1.5˜4km-mesh) in Gunma in FY2013. The following year, we further improved POTEKA to observe wind direction, wind speed and rainfall. Additionally, we added 93 locations, about 2km intervals, around the elementary school in order to achieve higher density than the existing observation network. Therefore, we can obtain real-time meteorological information per one minute in total 145 stations. This paper presents observation of downburst around Takasaki city and Maebashi city on 22 August 2014.

Downburst, accompanied with well-developed cumulonimbus, occurred and passed from Takasaki city to Maebashi city around 18:10. A significant drop in temperature is noticed around 17:45, (-0.47 ℃ per one minute on average). The distributions and occurrence time of cold air captured by POTEKA network well coincide with field survey results of the Japan Meteorological Agency. In addition, the first temperature drop was confirmed about 25 minutes before damage occurrence time of the downburst. Pressure jumps of 1-2 hPa were recorded at the same time as the temperature drop, and the average increase rate was +0.34hPa per minute. The pressure jump is regarded as a cool and high dense downdraft under the thunderstorms.

In comparison with the case of downburst on 11 August 2013 (Sato et al. 2014, Norose et al. 2014), the temperature decrease rate at last time and at this time are the average -1.15 ℃ and -0.47 ℃ per minute, the last case is 2 times larger than this time. Both sudden drops in temperature can be captured by POTEKA in advance to the occurrence of downburst hazard. Furthermore, such pressure jumps were recorded in both 2013 and 2014. But the surface pressure after the occurrence of downburst is maintained at the higher level than the pre-occurrence of downburst in 2014. Several downbursts seem to be continuously generated by the larger and more active cumulonimbus in 2014 than these of 2013, which produced the strong winds and kept the surface high pressure after the first downburst occurrence. We are going to further investigate the surface characteristics during downburst by using other meteorological elements (relative humidity, wind velocity, and etc.).

References

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2. Norose K, Kobayashi K, Kure H, Morita T. 2014: Surface and Pressure Distributions of Downburst captured by the surface dense observation network POTEKA(2). Meteor. Soc. Japan. 2014 Spring Meeting. 105. 224pp. (in Japanese)

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